Recent Revisions of GNP Data

Keith M. Carlson

IN December 1985, the U.S. Department of Commerce announced a major revision of the nation's income and product accounts.[1] This revision, which is done about every five years, was the eighth of its kind. The purpose of this comprehensive revision was to update the gross national product (GNP) accounts, reflecting any new information, new procedures, and changes in the economic structure.

The U.S. income and product accounts were created in the 1930s, though they were not published on a regular basis until after World War II.[2] Their purpose is to provide a measure and understanding of the economic health of the nation. (For a brief summary of national income accounting, see the shaded box on p. 18.)

This article discusses the nature and extent of the most recent revision, along with some background information to aid the nontechnical reader. The article focuses on the effect of the revision on GNP, output and prices. The effect of the revision on the interpretation of post-World War II economic fluctuations and on certain key historical relationships also receives consideration.

THE MAGNITUDE OF THE REVISION

The shaded box on page 20 describes the major sources of the revision. Although GNP data for earlier years were also affected somewhat, the revision primarily affected GNP data from 1970 to 1984.

Nominal GNP

Table 1 summarizes the effect of the revision on nominal GNP for alternate years from 1948 to 1984. The revision has increased the level of GNP in each year shown; the largest changes, however, have occurred since 1970. The revision had little impact on the annual growth rates of nominal GNP; it raised the growth rate from 1948–84 from 7.6 to 7.7 percent.

Real GNP Growth

Nominal GNP revisions can be compared directly in terms of dollar amounts; constant-dollar, or real, GNP estimates cannot be as easily compared because the base period has been shifted. Consequently, to compare the effect of the revision on real GNP estimates, one must examine its impact on the growth rates of the old and revised real GNP estimates.

Keith M. Carlson is an assistant vice president at the Federal Reserve Bank of St. Louis. *Sandra Graham and Thomas A. Pollmann provided research assistance.*

[1] A detailed discussion of the revision can be found in various articles in the *Survey of Current Business*. See U.S. Department of Commerce (1985b, 1985c).

[2] For a discussion of the historical development of the U.S. income and product accounts, see U.S. Department of Commerce (1985a).

The Essentials of National Income and Product Accounting

The national income and product accounts provide a statistical summary of the economy, showing the volume, composition and uses of the national output. The total production of the nation is measured in two ways: in terms of products, that is, the value of goods and services, and in terms of the incomes generated in production. The accompanying table summarizes the national income and product account for 1984.

The left side of the table, the income side of the account, shows wages and salaries and other forms of income, indirect business taxes and capital consumption allowances (and other small items) generated in the production process. The total of these items is labeled "charges against gross national product." (Because the two sides of the income and product account are estimated independently, given imperfections in the source data, they are not necessarily equal. The error is called statistical discrepancy; it has no economic significance.)

The right side of the table, the product side, is divided into the major markets for the economy's output: personal consumption, business investment, government purchases and net exports. The sum of the expenditures is the gross national product (GNP).

The table is only one of many in the accounts, but it is the most fundamental one. Among the most important of the remaining accounts are those that show the receipts and expenditures of the major economic groups in the economy. The personal income and outlay account shows the income receipts and expenditures of persons. The government receipts and expenditures account summarizes the activities of federal, state and local governments. The foreign transactions account summarizes international transactions that impinge on U.S. income and product. Finally, the gross saving and investment account cuts across economic groups, showing their saving and investment transactions in summary form.

National Income and Product Account, 1984 (billions of dollars)

Compensation of employees	$2,221.3	Personal consumption expenditures	$2,423.0
Proprietors' income	233.7	Gross private domestic investment	674.0
Rental income	10.8	Government purchases of goods and services	736.8
Corporate profits and inventory valuation adjustment	273.3	Net exports of goods and services	−59.2
Net interest	300.2		
National income	3,039.3		
Business transfer payments	17.3		
Indirect business tax and nontax liability	310.6		
Less: Subsidies less current surplus of government enterprises	10.1		
Capital consumption allowances	418.9		
Statistical discrepancy	−1.5		
CHARGES AGAINST GROSS NATIONAL PRODUCT	$3,774.7	GROSS NATIONAL PRODUCT	$3,774.7

NOTE: Numbers may not add due to rounding.
SOURCE: Council of Economic Advisers.

Table 1

A Comparison of Old and Revised Nominal GNP: 1948–84 (dollar amounts in billions)

	Old	Revised	Percent change
1948	$ 259.5	$ 261.6	.81%
1950	286.5	288.3	.63
1952	348.0	351.6	1.03
1954	366.8	372.5	1.55
1956	421.7	428.2	1.54
1958	449.7	456.8	1.58
1960	506.5	515.3	1.74
1962	565.0	574.6	1.70
1964	637.7	649.8	1.90
1966	756.0	772.0	2.12
1968	873.4	892.7	2.21
1970	992.7	1,015.5	2.30
1972	1,185.9	1,212.8	2.27
1974	1,434.2	1,472.8	2.69
1976	1,718.0	1,782.8	3.77
1978	2,163.9	2,249.7	3.97
1980	2,631.7	2,732.0	3.81
1982	3,069.3	3,166.0	3.15
1984	3,662.8	3,774.7	3.06

Table 2

The Growth of Real GNP: Old and Revised Series (compounded annual rates of change)

Peak-to-Peak	Previous	Revised	Direction of revision
IV/1948 – II/1953	5.3%	5.7%	+
II/1953 – III/1957	2.2	1.8	–
III/1957 – I/1960	3.0	2.8	–
I/1960 – III/1969	4.2	4.0	–
III/1969 – IV/1973	3.5	3.0	–
IV/1973 – I/1980	2.7	2.5	–
I/1980 – III/1981	1.1	0.6	–
III/1981 – III/1985[1]	2.6	2.4	–
IV/1948 – III/1985[1]	3.4	3.2	–

[1]Data calculated by the previous method are not available after III/1985.

Table 3

Changes in the GNP Deflator: Old and Revised Series (compounded annual rates of change)

Peak-to-Peak	Previous	Revised	Direction of revision
IV/1948 – II/1953	2.2%	1.9%	–
II/1953 – III/1957	2.5	2.9	+
III/1957 – I/1960	1.9	2.3	+
I/1960 – III/1969	2.6	2.8	+
III/1969 – IV/1973	5.2	5.9	+
IV/1973 – I/1980	7.6	8.0	+
I/1980 – III/1981	9.8	9.6	–
III/1981 – III/1985[1]	4.1	4.3	+
IV/1948 – III/1985[1]	4.1	4.3	+

[1]Data calculated by the previous method are not available after III/1985.

Table 2 summarizes, on a peak-to-peak basis, the growth of the old and revised estimates of real GNP from 1948 to 1985. The growth of real GNP was higher only for the earliest period, which includes the defense buildup for the Korean War. All other revised peak-to-peak growth rates were lower; as a result, real GNP growth for the entire IV/1948–III/1985 period was revised downward about 0.2 percent, from a 3.4 percent annual growth rate using the old estimates to a 3.2 percent rate with the revised data.

GNP Deflator

Changes in the GNP deflator reflect changes in both prices and the composition of spending. Consequently, revision of the GNP accounts affects estimates of the deflator via several channels. Table 3 summarizes rates of change in the GNP deflator for peak-to-peak periods from 1948 to 1985.

With only two exceptions, IV/1948–II/1953 and I/1980–III/1981, the change in the deflator was revised upward. In conjunction with the virtually identical-sized revisions in the growth of real GNP summarized in table 2, it is clear that the revision primarily redistributed a given change in nominal GNP from real output to higher prices. For the period as a whole, the revised deflator increased at a 4.3 percent annual rate, up slightly from the previously estimated 4.1 percent rate.

THE EFFECT OF THE REVISION ON BUSINESS CYCLES

As pointed out above, the revision had only a minor effect on the growth of nominal GNP: the growth of real GNP was revised downward slightly and the in-

The Sources of National Income and Product Accounts Revision

The Commerce Department divides the sources of revision into two major categories: (1) definitional and classificatory, and (2) statistical.[1] Definitional and classificatory changes update the accounts to reflect the changing structure of the U.S. economy. Statistical changes incorporate newly available and revised source data, improved estimating procedures and a shift in the base period for calculating constant-dollar estimates and the associated price indexes.

Definitional and Classificatory Changes

This category includes: (1) reclassification of certain business expenditures as investment, (2) changed treatment of federal employment benefit programs, (3) changed treatment of certain foreign transactions, and (4) reclassification of certain government assistance programs. Despite numerous definitional and classificatory changes, the revision of nominal GNP arising from this source was primarily attributable to (1) the capitalization of major replacements to residential structures and (2) the imputation of a social insurance fund for military retirement. The net effect of other changes on GNP was slightly negative.

Expenditures for the replacement of major items (like a roof or a heating system) in a house were reclassified as investment in residential structures. Previously, such replacements were charged off to current expense. This change increased nominal GNP by $14.1 billion in 1984.

The Defense Authorization Act of fiscal 1984 established a military retirement trust fund in which contributions by the government are equal to benefits paid. These expenditures are now treated as national defense purchases; previously, such benefits had been included in government transfer payments. This change increased nominal GNP in 1984 by $16.7 billion.

[1]A listing of these changes is provided in U.S. Department of Commerce (1985b, 1985c).

Statistical Changes

These changes include the shift of the base period from 1972 to 1982, the incorporation of new and revised data from regularly used sources available annually or on a "benchmark basis," the use of new source data, and new estimation procedures.

The statistical changes with the largest impact were as follows:

(1) *Improved adjustments for misreporting on tax returns.* Although these adjustments are related to "underground" activities, the adjustment itself is not a measure of the *size* of the underground economy.[2] These adjustments increased 1984 nominal GNP by $44.1 billion.

(2) *Improved methodology and new data for residential investment.* Residential investment was revised upward by $25.2 billion in 1984.[3] About half of this increase was attributable to the new procedure of capitalized major replacements to structures; the rest reflected statistical changes due to new data.

(3) *The shift in the base period from 1972 to 1982.* This shift reduced the rate of real growth and, for a given path of nominal GNP, increased the rate of change in the GNP deflator. See box on opposite page for an example.

(4) *Improved price index for computers.* This change had no effect on nominal GNP; however, it improved estimates of real producers' durable equipment expenditures. Previously, the Commerce Department had assumed that computer prices had remained unchanged. The Commerce Department now incorporates a 10 percent decline per year in computer prices from 1970 to 1984. This change substantially increases estimates of real computer expenditures over the period.

[2]For example, GNP does not include illegal activities. For a detailed discussion of the underground economy, see Carson (1984) and Parker (1984).

[3]This leaves $14.9 billion of statistical changes affecting nominal GNP that are attributable to other changes. The Commerce Department did not allocate these remaining changes.

The Effect of Shifting the Base Period on Real GNP Growth

The effect on real GNP of shifting to a more recent base period can be shown by using a simplified example in which there are only two commodities, A and B. Real GNP can be obtained by multiplying the quantities of A and B sold in each year by their prices in the base period. For example, real GNP growth can be calculated as follows:

(1) Using year 1 as base period:

	Price (dollars)		Quantity (number)		Value (dollars)	
	Year 1	Year 2	Year 1	Year 2	Year 1	Year 2
A	$5	$9	10	11	$ 50	$ 55
B	6	7	10	16	60	96
					$110	$151

$$\text{Real GNP growth} = \frac{\$151}{\$110} = 1.373 \text{ or } 37.3\%$$

(2) Using year 2 as base period:

	Price (dollars)		Quantity (number)		Value (dollars)	
	Year 1	Year 2	Year 1	Year 2	Year 1	Year 2
A	$5	$9	10	11	$ 90	$ 99
B	6	7	10	16	70	112
					$160	$211

$$\text{Real GNP growth} = \frac{\$211}{\$160} = 1.319 \text{ or } 31.9\%$$

In both cases, the growth rate of real GNP is a weighted average of growth rates of A and B. In case 1, the weights are based on the prices in year 1; in case 2, the weights are based on prices in year 2. The example reflects the assumption that the price of A rises more than the price of B, while the quantity of A increases less than B. As a result, A receives more weight when year 2 is used as the base period than when year 1 is used.

crease of the GNP deflator was revised upward slightly. Because these changes are due chiefly to the shift of the base period from 1972 to 1982, they had no significant effect on the general movement of prices and real GNP over the post-World War II period.

Table 4 summarizes real GNP growth over expansions and contractions on the old and the revised basis. An examination of the quarterly movements of real GNP around turning points reveals no changes in the timing of the business cycle. There were, however, some changes in the severity of contractions and the strength of expansions.

The left side of table 4 reveals that real growth in all economic expansions was revised downward, except for the Korean War expansion of 1949–53. Real growth during the 1970–73 and 1980–81 expansions was reduced most by the revisions; all revisions, however, were minor. Moreover, the ordering of the expansion periods from strongest to weakest was left unchanged by the revision.

The right side of table 4 summarizes the effect of the revision on the severity of recessions. The effect was not as uniform as for expansions: recessionary declines in real GNP were revised upward during some contractions and downward during others. Five contractions were found to be more severe than previously estimated, although in no case was the revision dramatic. The largest downward revision in real growth was for the 1948–49 recession.

THE EFFECT OF THE REVISION ON KEY MACROECONOMIC RELATIONSHIPS

One question of interest to economists is whether the revision influenced certain key macroeconomic relationships that are used in analyzing the economy and formulating economic policy. While many relationships could be examined, this section focuses specifically on four of them.[3] Simple summary relationships were estimated for the 1956–84 period using

[3]For a summary and discussion of such relationships for the 1956–81 period, see Carlson and Hein (1983).

Table 4

Real GNP Growth over the Business Cycle: Old and Revised Series (compounded annual rates of change)

Expansion	Previous	Revised	Change	Contraction	Previous	Revised	Change
IV/1949 – II/1953	7.3%	8.0%	+0.7	IV/1948 – IV/1949	−1.4%	−2.0%	−0.6
II/1954 – III/1957	3.9	3.4	−0.5	II/1953 – II/1954	−3.2	−3.0	+0.2
I/1958 – I/1960	5.5	5.4	−0.1	III/1957 – I/1958	−6.6	−7.0	−0.4
IV/1960 – III/1969	4.7	4.5	−0.2	I/1960 – IV/1960	−1.5	−1.4	+0.1
IV/1970 – IV/1973	5.3	4.6	−0.7	III/1969 – IV/1970	−0.5	−0.7	−0.2
I/1975 – I/1980	4.4	4.1	−0.3	IV/1973 – I/1975	−3.9	−3.5	+0.4
II/1980 – III/1981	3.3	2.7	−0.6	I/1980 – II/1980	−9.0	−9.1	−0.1
III/1982 – III/1985	4.6	4.3	−0.3	III/1981 – III/1982	−3.0	−3.4	−0.4

percentage changes (where applicable) on a fourth-quarter-to-fourth-quarter basis. No attempt was made to search for the "best" equation; rather, the equations were chosen for their illustrative simplicity. They are intended solely to illustrate the effect of the revision on the various relationships in the simplest form possible.

Money and Nominal GNP

The relationship between money and GNP is a fundamental one in terms of the monetarist view of how total spending is determined. In a simple version, it can be estimated as the relationship between the four-quarter percent change of nominal GNP ($\dot{Y}_4$) and the four-quarter percent change of money ($\dot{M}_4$).[4] The equation used here also includes a dummy variable (D) for the 1982–84 period because previous studies have indicated that the relationship shifted significantly after 1981.[5]

When this equation was estimated over the 1956–84 period, using both the previously published and revised data, the results were those shown in lines 1a and 1b of table 5. An inspection of the estimated equations indicates a slight strengthening in the relationship between nominal GNP and money, with the coefficient on money staying close to its theoretically expected value of one. The t-statistics (measures of the precision of the coefficient estimates) increased; $\bar{R}^2$, a measure of the explanatory power of the equation, also rose. The standard error (SE) of the equation, a measure of the accuracy of the fitted equation in terms of its dependent variable, was reduced by 4 percent. The Durbin-Watson (DW) statistic, a measure of residual correlation, showed a slight improvement.

Inflation and Money Growth

The relationship between inflation and money growth is another fundamental one in macroeconomics. Since, during the 1970s and 1980s, changes in the price of energy played a key role affecting movements of the price level, this variable was also included in the estimation of the relationship. The estimated equation for inflation ($\dot{P}_4$) includes the 16-quarter rate of change of money ($\dot{M}_{16}$) measured from fourth quarter to fourth quarter, the four-quarter percent change of the relative price of energy ($\dot{P}^E_4$), and the dummy variable discussed earlier.[6]

When estimated over the 1956–84 period, the results were those shown in lines 2a and 2b of table 5. As the statistics show, the revision improved the inflation equation marginally; both $\bar{R}^2$ and the standard error improved slightly, and the coefficient on money stayed close to its expected value of one. In addition, the t-statistics all increased. Signs of positive autocorrelation also appeared to be removed.

Unemployment Rate and Real GNP

Another relationship of interest to macroeconomists is the relationship between the unemployment rate and the growth of real GNP, a variant of what is called Okun's law. In the simple relationship esti-

[4]For estimation purposes, only fourth-quarter data were used from each calendar year.

[5]With the exception of the unemployment-real GNP equation, results presented here include this dummy variable.

[6]The choice of 16 quarters for money growth reflects previous research. See Carlson and Hein.

Table 5
Macroeconomic Relationships Using Old and Revised Data

Money and Nominal GNP

(1a) Using previously published data:

$$\dot{Y}_4 = 3.83 + .89\,\dot{M}_4 - 3.51\,D \qquad \bar{R}^2 = .46,\ SE = 2.25,\ DW = 2.12$$
$$(4.10)\ (5.10)\ \ (2.35)$$

(1b) Using revised data:

$$\dot{Y}_4 = 3.80 + .91\,\dot{M}_4 - 3.77\,D \qquad \bar{R}^2 = .50,\ SE = 2.15,\ DW = 1.97$$
$$(4.26)\ (5.43)\ \ (2.64)$$

Inflation and Money Growth

(2a) Using previously published data:

$$\dot{P}_4 = .08 + .97\,\dot{M}_{16} + .08\,\dot{P}_4^E - 3.05\,D \qquad \bar{R}^2 = .82,\ SE = 1.15,\ DW = 1.65$$
$$(.14)\ (7.68)\ \ (3.06)\ \ (3.46)$$

(2b) Using revised data:

$$\dot{P}_4 = .21 + 1.00\,\dot{M}_{16} + .07\,\dot{P}_4^E - 3.10\,D \qquad \bar{R}^2 = .84,\ SE = 1.10,\ DW = 1.89$$
$$(.39)\ (8.31)\ \ (3.14)\ \ (3.67)$$

Unemployment Rate and Real GNP

(3a) Using previously published data:

$$\Delta U_4 = 1.20 - .34\,\dot{X}_4 \qquad \bar{R}^2 = .70,\ SE = .64,\ DW = 2.01,\ \rho_1 = -.28$$
$$(7.36)\ (8.15)$$

(3b) Using revised data:

$$\Delta U_4 = 1.15 - .35\,\dot{X}_4 \qquad \bar{R}^2 = .70,\ SE = .67,\ DW = 1.99,\ \rho_1 = -.37$$
$$(7.34)\ (8.11)$$

Short-Term Interest Rate and Inflation

(4a) Using previously published data:

$$RS = 2.40 + .91\,\dot{P}_4 + 1.22\,D \qquad \bar{R}^2 = .54,\ SE = 1.25,\ DW = 1.89,\ \rho_1 = .74$$
$$(2.07)\ (5.67)\ \ (.92)$$

(4b) Using revised data:

$$RS = 3.47 + .72\,\dot{P}_4 - .69\,D \qquad \bar{R}^2 = .39,\ SE = 1.40,\ DW = 1.88,\ \rho_1 = .85$$
$$(1.98)\ (3.95)\ \ (.45)$$

NOTE: Absolute value of t-statistics in parentheses.

mated below, ΔU_4 is the change in the unemployment rate from fourth quarter to fourth quarter, and $\dot{X}_4$ is the percent change in real GNP from fourth quarter to fourth quarter.

When this relationship was estimated from 1956 to 1984, the results were those shown in lines 3a and 3b of table 5. Because the residuals were negatively correlated, the equations were adjusted for first-order serial correlation. The estimates indicate that the explanatory power of the relationship was unchanged using the revised data and that a 1 percent increase in output still reduces the unemployment rate by about one-third of a percentage point. The standard error increased only slightly, and the estimated coefficients did not change significantly.

Short-Term Interest Rate and Inflation

Interest rates generally move with the expected rate of inflation. Because expected inflation cannot be observed directly, estimates of its effect on interest rates require the use of "proxies"; the actual rate of change in the GNP deflator is used here as an approximation for the expected rate in the interest rate equation. The four-month commercial paper rate (RS) was estimated as a function of the four-quarter rate of inflation ($\dot{P}_4$) measured from fourth quarter to fourth quarter and the dummy variable described previously.[7] It was necessary to estimate the equation using a first-order serial correlation adjustment.

Lines 4a and 4b of table 5 show the results. The short-term interest rate relationship deteriorated when estimated with the revised data. Such a result is probably not surprising, since the revised data are different than those that were used by market participants to form expectations. Even though the coefficient on inflation declined, it is not significantly different from one, its theoretically expected value.

SUMMARY

The Department of Commerce has recently revised the GNP accounts. The revision results from a variety of changes, including a shift of the base period from 1972 to 1982. This change in base period affects constant-dollar, or real, estimates as well as serving as the base year for the price indexes.

[7] A similar attempt was made to estimate a long-term interest rate equation but the results were meaningless. Conventional adjustments were unsuccessful in removing the positive correlation of the residuals.

The revision resulted in substantial increases in the *level* of nominal GNP from 1948 to 1984. It had little effect on the *rates of change* of GNP. The revised figures for real GNP yield a slower pace of economic growth; it was revised downward from a 3.4 percent annual rate to a 3.2 percent rate from 1948 to 1985. The rate of change of the GNP deflator was revised upward, from a 4.1 percent rate to a 4.3 percent rate over the period.

While the revision had no effect on business-cycle turning points, it had some impact on the strength of expansions and the severity of recessions. Revisions of the growth of real GNP over the business cycle were within the -0.7 to $+0.7$ percentage-point range.

This article also examined the effects of the revision on simple versions of certain key macroeconomic relationships. These relationships cover the impact of money growth on nominal GNP and inflation, the relationship between real GNP growth and unemployment, and the impact of inflation on short-term interest rates.

The results were mixed. The two relationships linking money growth to GNP and inflation improved marginally using the revised data. The other relationships deteriorated marginally. On net, the revision had no major effect on the pattern of recent fluctuations in the economy.

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